

ART THE COMRADE OF SCIENCE.¹

IT has long been known that Mr. A. H. Thayer, the discoverer of the great principle of countershading in nature, was preparing a fully illustrated exposition of his observations and theories, and that his son was helping him in the enterprise. The present beautifully illustrated and finely printed work is the result. The great discovery of the obliteration of apparent solidity by means of countershading, first published

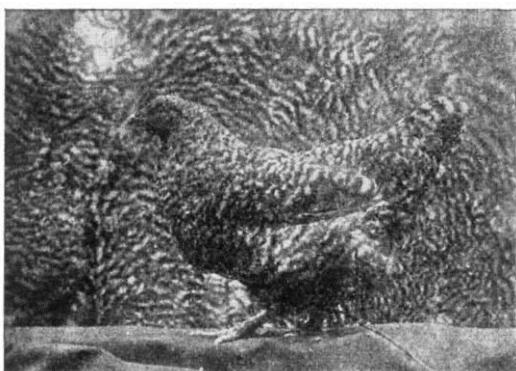


FIG. 1.—Plymouth Rock Hen, lacking countershading, and therefore conspicuous against a background of Plymouth Rock skins.

in 1896 (*The Auk*, vol. xiii., pp. 124 and 318), was convincingly illustrated in this country by the models prepared by Mr. A. H. Thayer, and presented to the natural history museums of London, Oxford, and Cambridge. An account of the principle, as well as the description of the Oxford model prepared by the present writer, appeared in NATURE for April 24, 1902 (vol. lxv., p. 596).

After the great and wide-reaching discovery which has probably been accepted by all naturalists who have studied it, the author has gradually extended his conclusion that the colours of animals are adapted for concealment, and carried it into regions where a very different interpretation had been accepted. Thus in his papers in the Transactions of the Entomological Society of London (1903, pp. 553-569), and in the *Popular Science Monthly* (December, 1909, p. 550), Mr. Thayer maintains that appearances which have been explained as warning, mimetic, and sexual are to be interpreted by the one dominant and universal principle of concealment in nature. It cannot be said that, in these later developments, Mr. Thayer has succeeded in convincing any large number of naturalists, and it is therefore of especial importance that a detailed, complete, and fully illustrated statement should have appeared in the present volume.

The great bulk of the work, which opens with an introductory essay, dated 1907, by Mr. A. H. Thayer, is occupied, first, by a full and admirable exposition of the principle of obliterative shading and the combination with it of "picture patterns," and secondly, by a sketch of the distribution of these methods of concealment throughout vertebrate animals and insects, the birds being treated in far greater detail than any

¹ "Concealing-Coloration in the Animal Kingdom." An Exposition of the Laws of Disguise through Colour and Pattern: being a Summary of Abbott H. Thayer's Discoveries. By Gerald H. Thayer. With an Introductory Essay by A. H. Thayer. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1910.) Price 31s. 6d. net.

other group. Mr. Thayer's later views are not expounded separately, but are to be found scattered in various parts of the volume, which must be carefully studied as a whole by any reader who would do justice to the author and his father.

The value of obliterative countershading is well illustrated by figures of two breeds of fowl in which it is lacking. However closely such fowls may harmonise with the colour of a flat background, they must be rendered conspicuous against it by means of shadow, as is at once obvious in Fig. 1.

A series of interesting photographs of models makes it clear that obliterative shading is even more important than markings for the purpose of concealment. Thus, the model in Fig. 2 represents a relatively inconspicuous gap in the pattern of the background; that in Fig. 4, possessing the pattern, is by comparison a strikingly distinct and solid object. We are thus led to conclude that the perfect obliteration represented in Fig. 3 depends in larger measure upon the principle illustrated in Fig. 4 than upon that shown in Fig. 2.

The vast importance of this same principle is demonstrated, not only by diagrams, but by large numbers of representations of actual animals to be found in later pages of the work. A striking example is seen in Fig. 5, where the animal has been photographed in a position which reverses the obliterative tendency of its colouring in the normal position. We here get maximum conspicuously—the lightest tint in the strongest light, the darkest in the deepest shadow.

The relation of the pattern to perspective is discussed in an extremely interesting and original section (chapter iii.), where the conclusion is reached that "the obliteratively shaded surface must bear a picture of such background as would be seen through it if it

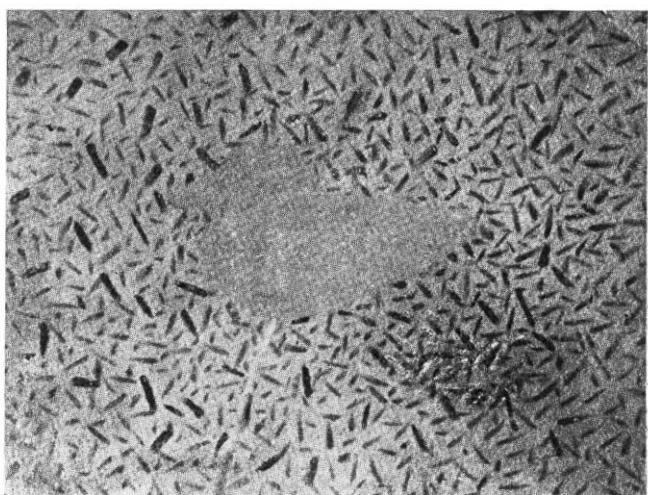


FIG. 2.—Bird-shaped Solid Model, obliteratively shaded in full, and correctly lighted, but revealed by the want of pattern.

were transparent." This is well illustrated by the diagram shown in Fig. 6, where the smaller pattern of the highest part of the bird is seen against the receding, and therefore to the eye diminished, details of the background.

Mr. Thayer discriminates sharply between all such *obliterative coloration* depending on countershading combined with background picturing, and *mimicry*, or the simulation of a solid object. He truly points out

that the goal of the first principle is *invisibility*, of the second *deceptive visibility*. "The latter principle is open to unlimited variations of method and result, whereas the former . . . is in its main essentials strictly limited. There are innumerable kinds of solid

graphs ever taken of obliteratively coloured birds in nature" (p. 46). The two points by which the bird is most easily recognised are the dark eye and the dark shadow under the feathers, so that this wonderful illustration helps us to understand the importance of eye-masking markings (see pp. 81, 82), as well as of obliterative counter-shading.

The coloured plates of the "Male Ruffed Grouse in the forest" (II.), the "Cottontail Rabbit" (VII.), and the "Copperhead Snake on dead leaves" (XI.) are very remarkable illustrations, justly claimed by the author and his father to be "the first ever published, which rightly illustrate and in some respects do justice to the wonderful effects of obliterative coloration, based on the great law of *obliterative shading*" (p. 128).

The five coloured plates of caterpillars (XII.-XVI.) are extremely beautiful, showing for the first time the important part played by obliterative shading in these forms. The attitudes of caterpillars generally must be re-examined in the light now thrown upon them by this great artist-naturalist; for there is little doubt that many of the best-known and commonest illustrations represent an inaccurate position. It is unfortunate that the names of so few of the figured species were ascertained, but there should be little difficulty in the identification of such beautiful repro-

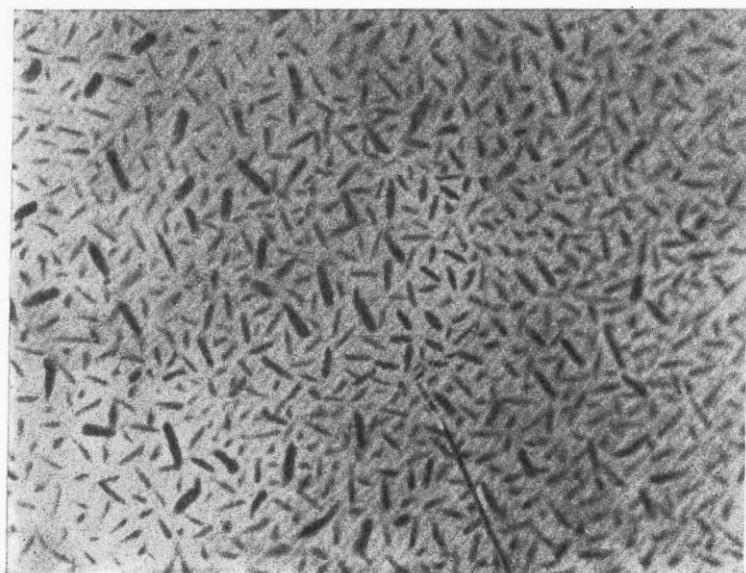


FIG. 3.—Model similar to that shown in Fig. 2, and similarly lighted, but concealed by possessing a pattern like that of the background.

objects for animals to simulate in appearance, but there is only one way to make a solid object in a natural lighting cease to appear to exist" (p. 25).

The use of the term "mimicry" to indicate the second category, although common, is to be deprecated. It is inconvenient to apply the same term to the resemblance of a moth to a wasp, and that of a caterpillar to a twig. The wasp-like moth is always spoken of as an example of mimicry; and the term *imitation* may be conveniently used in a technical sense to include the twig-like caterpillar and all the other innumerable examples of special protective resemblance. The important classification of cryptic resemblances, which Mr. Thayer now establishes more thoroughly and correctly than before, may be appropriately expressed by the use of the terms (1) *obliterative* or *aphanistic coloration*, and (2) *imitative* or *eikonic resemblance*.

No fewer than sixteen out of the twenty-seven chapters of the book are concerned with the colouring of birds, the patterns being classified according to the nature or distance of the background that is pictured. A vast amount of patient and loving observation of nature is here summed up and expressed. We shall look forward with the deepest interest to the comments of those special students of bird-life in Europe and America, who will make a point of testing these conclusions by fresh observations made in the field from the author's point of view. This is written in no spirit of doubt, for Mr. Thayer's statements and illustrations are, with certain exceptions, to be considered later, most convincing. No naturalist could reasonably doubt, for example, the significance of the grass-pattern shown in Fig. 7, which the author justly describes as "one of the most remarkable photo-

ductions. There is an evident inadvertence in the orientation of Fig. C or D on plate XII., both represented in a similar position, although D is described as the reverse of C.

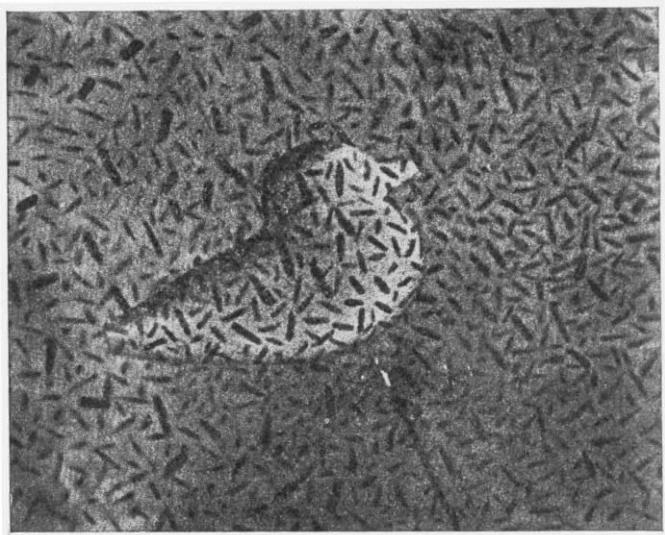


FIG. 4.—Model similar to that shown in Fig. 3, and similarly patterned, but wrongly lighted and therefore conspicuous.

The necessities of space prevent a further account of this remarkable and splendidly illustrated exposition of the principles of obliterative colouring, and its distribution throughout the animal kingdom. We must now, in the concluding paragraphs, deal with speci

interpretations and later developments which are likely to cast an entirely undeserved suspicion upon this admirable account of a great discovery.

In the first place, in the present state of our knowledge of a most difficult subject and the great need for numberless exact observations and precise records,



FIG. 5.—Domestic Hare laid on its back, out of doors, so that the oblique shading is reversed. Photographed from life.

illustrations in which the background has been "copied, colour-note for colour-note," from the animal itself, are a hindrance and not a help (plates I., III., VI., VIII., IX., X., and Fig. 123). The inferred environment is not necessarily incorrect—the rattlesnake (Fig. 123) at least is almost certainly represented with truth—but the inference is not scientific evidence, and it is likely to act as a hindrance, because some readers may be led into accepting it as a proof, others into scoffing at the whole subject. Furthermore, the inferred significance of the animal's colouring may be wholly mistaken, as I doubt not is the case with the beautiful and poetic plates IX. and X., representing "flamingoes at dawn or sunset, and the skies they picture." Such an interpretation is quite inconsistent with the wonderful representation of flamingo life prepared by Dr. F. M. Chapman for the American Museum of Natural History, New York. The present writer had seen the representation and knew well the unrivalled knowledge and experience which had gone to the making of it, and he therefore wrote to his friend and asked his opinion as to the meaning of the colours of these birds. Dr. Chapman kindly replied as follows:—

My observations of flamingoes (which I should add were made only in the Bahamas) lead to the belief that our American bird (*Phoenicopterus ruber*) is protected by its haunts and habits rather than by its colour. At all times, whether feeding singly or when nesting and solidly massed in hundreds, it is from any point of view an exceedingly conspicuous object. Apparently, therefore, it thrives only when it is beyond the reach of predatory Mammalia and Reptilia, its centres of abundance being oceanic islands, like the Bahamas or Galapagoes, or small keys off the mainland. It is true that flamingoes formerly visited the shores of southern Florida in great numbers, but they have never been known to nest there, and they frequented only the vast shallow bays where they could feed far from land, and where it was almost impossible to approach them; for it should be especially noted that these flamingoes are as shy as they are conspicuous. The character of the

regions they frequent usually enables them to see as far as they can be seen, and the brilliancy of their colours seems to be compensated for by their extreme wariness. For example, a professional hunter of flamingoes on the Florida coast tells me that for six days a week for two consecutive weeks he pursued a flock, estimated to contain 2000 flamingoes, without securing a single specimen.

I am, of course aware that man should not be classed among the natural enemies of the flamingo, nor their colours be explained from the human view-point, but the fact just mentioned at any rate illustrates the bird's alertness and the difficulty with which it is approached.

As, in the Bahamas, at any rate, the flamingo feeds only on molluscs, its colours are apparently not deceptive or aggressive. In short, it is my belief that the flamingo's colours are to be placed among the cases where colour has run riot, unchecked by any need for protection from enemy or prey, and that the bird has continued to exist only where the dangers to which of necessity its colour would expose it are happily absent.

The flamingo has been considered at some length. With regard to the peacock in the wood (plate I.), it can only be said here that the interpretation is hardly likely to be accepted by anyone who has watched the male bird displaying before the female or in rivalry with another male.

Nor are many naturalists likely to be convinced by Mr. Thayer's interpretation of recognition markings and warning colours, an interpretation rendered sufficiently clear by Figs. 8 and 9. Here, as in all other examples of animal colouring, Mr. Thayer considers the one dominant interpretation to be concealment,

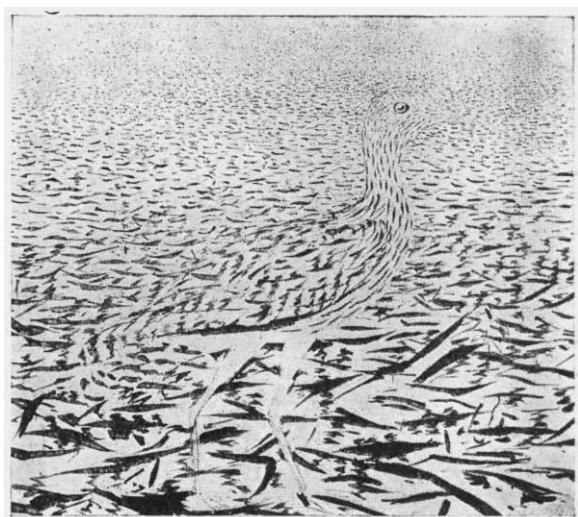


FIG. 6.—Diagram showing the picturing of perspective by animals' patterns. The bird is supposed to be looked at from the side and above so that the small pattern of its head and neck is against the more distant and therefore reduced pattern of the ground surface.

the Spilogale's "dark stripes passing for vegetation, and his white stripes for the sky." This explanation of warning colours has been recently criticised, and in the opinion of the present writer entirely refuted, by Mr. R. I. Pocock (Proc. Zool. Soc., 1908, pp. 944-959), and the corresponding interpretation of recognition



FIG. 7.—Rocky Mountain White-tailed Ptarmigan on her nest. Photographed from life by Evan Lewis.

markings by Mr. E. Thompson Seton ("Life-Histories of Northern Animals"). As regards the interpretation of the mimetic resemblances of butterflies as due to a syncryptic resemblance to flowers and the surrounding vegetation and its interstices, it is impossible to say



FIG. 8.—*Spilogale*, or Little Striped Skunk, seen from above—man's and hawk's point of view. From photograph of a stuffed skin, out of doors.

more than that such a theory does not explain many well-known characteristics of the mimetic groups.

Whatever be the verdict of the moment, a man will be judged and ought to be judged by what he has done, not by what he has failed to do. It has been

ETHNOGRAPHY AT THE BRITISH MUSEUM.
THE purchaser of this handbook will feel no regret that it is not cast in the form of a guide. Many, perhaps most, of those who buy museum publications do so as they leave the building, and although the

fate of such mementoes cannot be determined with certainty, it may be assumed that they are sometimes read at leisure. A descriptive handbook on broad lines is, therefore, a better investment for the average visitor than a guide of the old, and arid, type. The present example is worthy of the best fate that can befall it at the hands of the man who looks in from the street, and it will be cordially welcomed by those whose interest in ethnography is less casual and fortuitous.

The introduction contains a brief survey of the progress of geographical exploration from classical times onward, and traces the discoveries which rendered possible the development of the comparative study of mankind. The

scope of ethnography is defined in a concise discussion of man in his relation to the material world, to his fellows, and to the supernatural.

The greater part of the book, which deals with the collections as exhibited in the Museum, is arranged under geographical headings, and the limitations of the collections are naturally reflected in the handbook. Thus, under Persia, India, and Japan, the subject of arms and armour is practically the only one considered, whilst China is only referred to incidentally. The culture of Tibet, Ceylon, Indonesia, and some of the tribes of northern and central Asia, is entered into in greater detail. Useful summaries are given of the general conditions of the life and culture of the peoples of these areas, with reference not only to their arts and industries, but also to their customs and beliefs. Racial origins and affinities are briefly considered, and the

latest views are stated. The same treatment is adopted with regard to the peoples of Australia, Oceania, Africa, and America. Special mention may

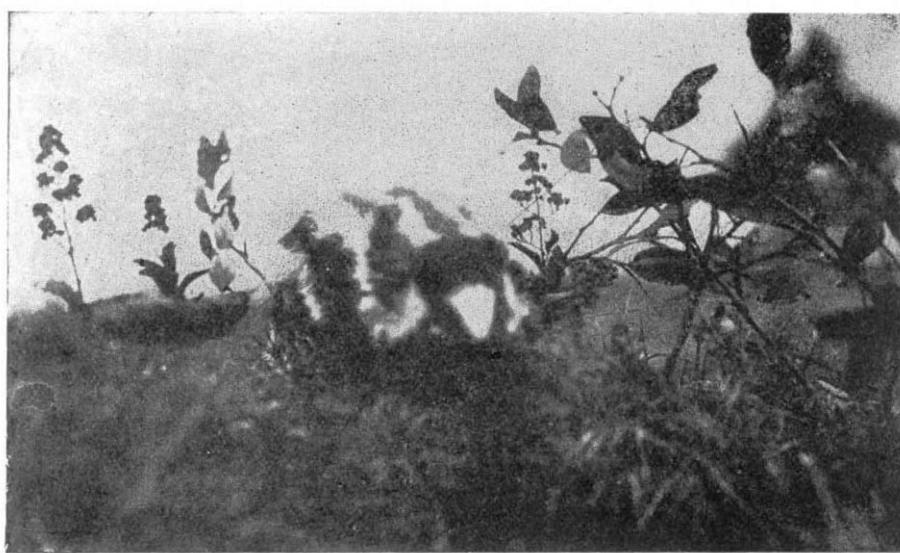


FIG. 9.—*Spilogale*, seen from below—mouse's and cricket's position. From photograph of stuffed skin, out of doors.

said that "What's hit is history, what's missed mystery." While the misses do not make the hits any the less, the mystery may serve to throw light upon the workings of a mind that has made history.

E. B. P.

1 "Handbook to the Ethnographical Collections," Pp. xv+201. (London: Printed by Order of the Trustees, British Museum, 1910.) Price 2s.